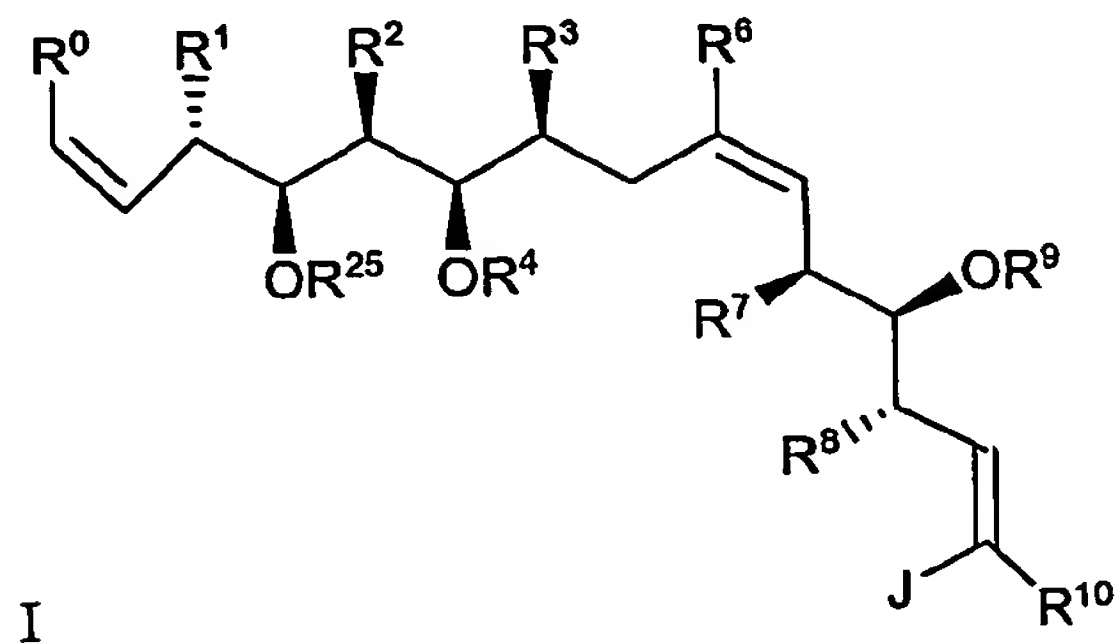
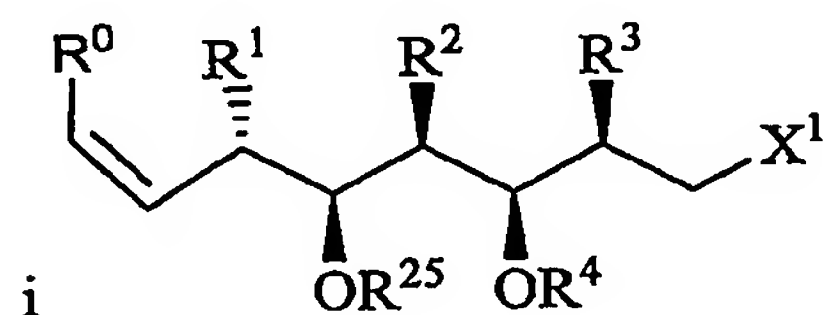


What is Claimed:

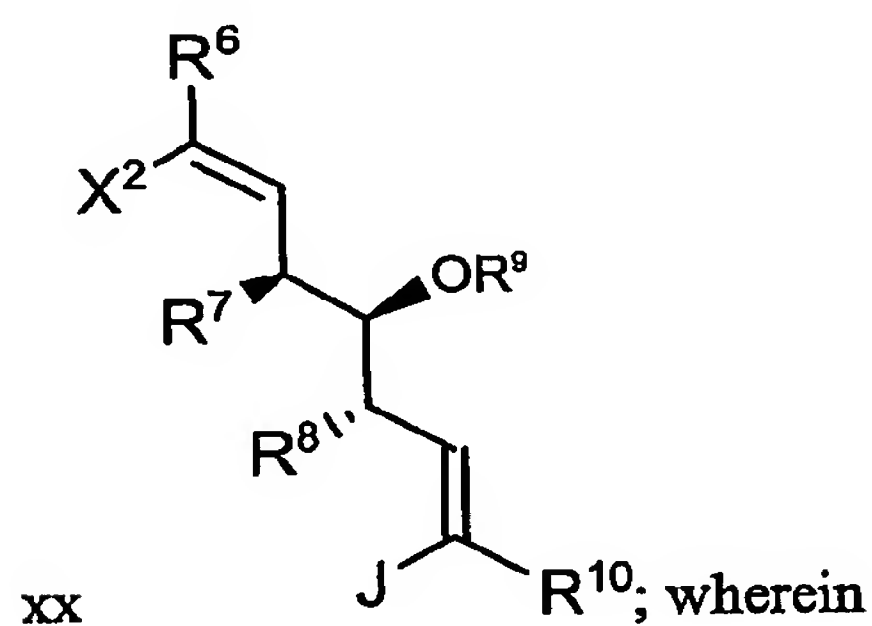
1. A process for synthesizing a compound of formula I



comprising contacting a compound of formula i



with a compound of formula xx



R^0 is C_{1-6} alkyl, C_{2-6} alkenyl, C_{2-6} alkynyl, $(CH_2)_r(C_{3-6}$ cycloalkyl), $(CH_2)_r$ (aryl) or $(CH_2)_r$ (heterocycle), wherein r is 0, 1, 2, 3, or 4;

R^1 , R^2 , R^3 , R^6 , R^7 , and R^8 are, independently, H or C_1 - C_{10} alkyl;

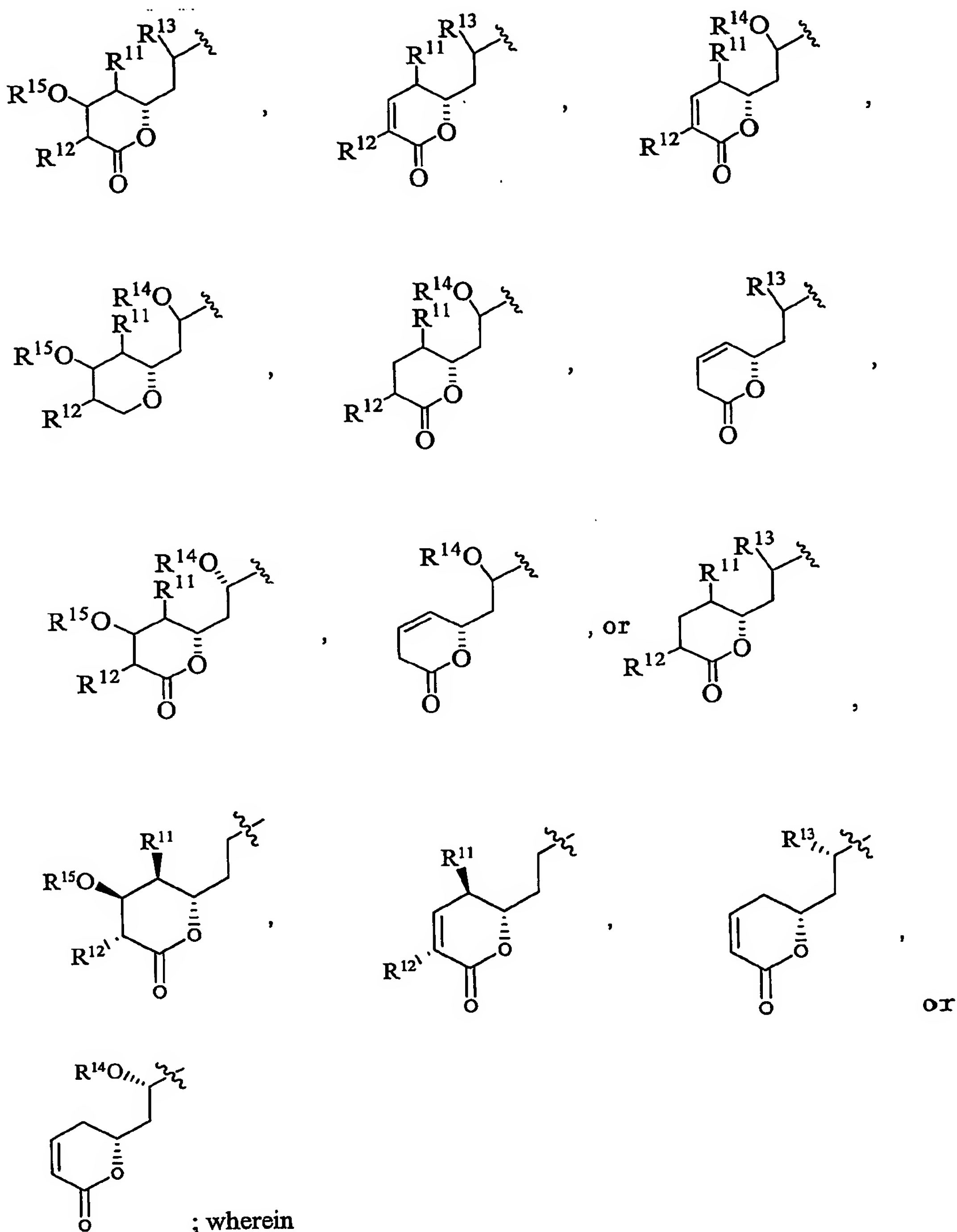
R^4 and R^9 are, independently, H or an acid labile hydroxyl protecting group;

R^{10} is hydrogen or C_1 - C_6 alkyl;

R^{25} is hydrogen or an oxidation labile hydroxyl protecting group;

X^1 and X^2 is, independently, a halogen, triflate, tosylate, or mesylate; and

J is



R¹¹, R¹² and R¹³ are each independently H or C₁-C₁₀ alkyl; and

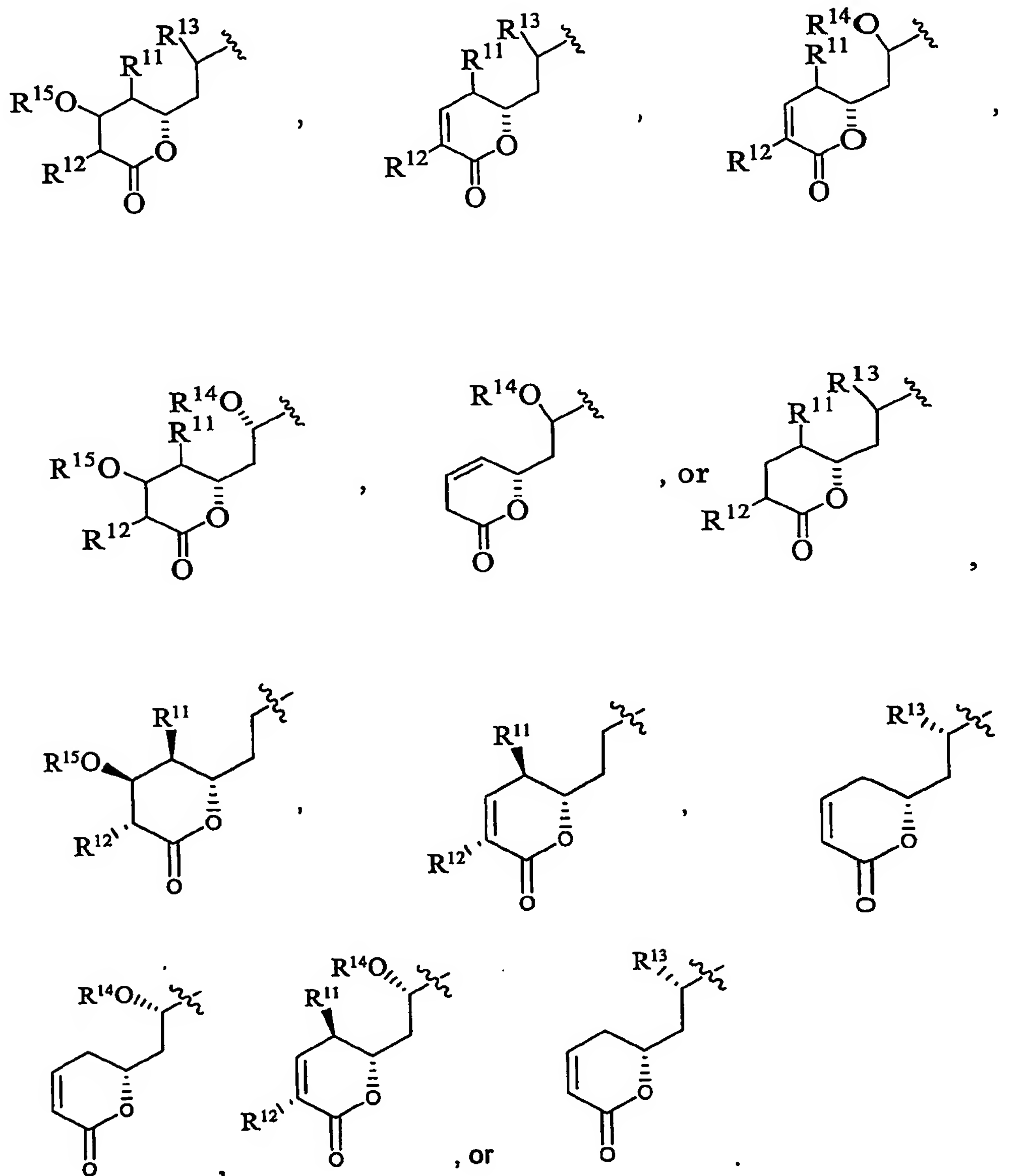
R¹⁴ and R¹⁵ are, independently, H or an acid labile hydroxyl protecting group.

2. The process of claim 1, further comprising

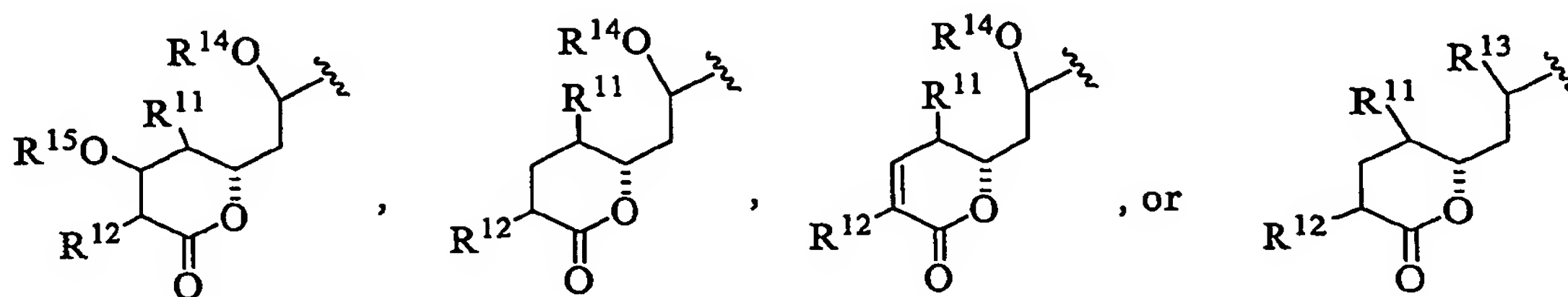
subjecting the process to a catalytically effective amount of a cross-coupling metal catalyst.

3. The process of claim 2, wherein the cross-coupling metal catalyst comprises nickel or palladium.
4. The process of claim 2, wherein the cross-coupling metal catalyst is Pd(0).
5. The process of claim 2, further comprising contacting the compound of formula i with a metallating agent, wherein the metallating agent is a compound containing boron, zinc, tin, magnesium, or aluminum, or a combination thereof.
6. The process of claim 5, wherein the metallating agent is a compound containing boron.
7. The process of claim 5, wherein the metallating agent is MeO-9-BBN.
8. The process of claim 5, wherein the metallating agent is a compound containing zinc.
9. The process of claim 5, wherein the metallating agent is ZnCl₂.
10. The process of claim 1, wherein at least one of X¹ and X² are iodo.
11. The process of claim 1, wherein R⁰ is ethylenyl.
12. The process of claim 1, wherein R¹, R², R³, R⁶, R⁷, and R⁸ are, independently, H or C₁-C₃ alkyl.
13. The process of claim 1, wherein R¹, R², R³, R⁶, R⁷, and R⁸ are CH₃.
14. The process of claim 1, wherein R⁴ and R⁹, independently, are *tert*-butyldimethylsilyl, triethylsilyl, methoxymethyl, methylthiomethyl, 2-methoxyethoxymethyl, acetyl, benzyloxymethyl, 2-(trimethylsilyl)ethoxymethyl or allyl.
15. The process of claim 1, wherein R⁴ is *tert*-butyldimethylsilyl.
16. The process of claim 1, wherein R⁹ is methoxymethyl.
17. The process of claim 1, wherein R¹⁰ is CH₃.
18. The process of claim 1, wherein R¹¹, R¹² and R¹³ are CH₃.

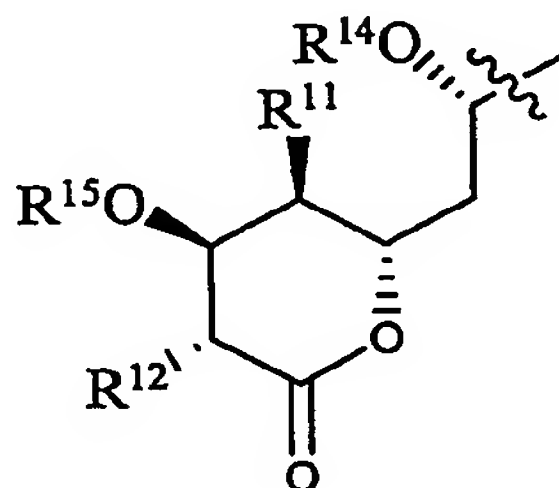
19. The process of claim 1, wherein R^{14} and R^{15} are, independently, *tert*-butyldimethylsilyl, triethylsilyl, methoxymethyl, methylthiomethyl, 2-methoxyethoxymethyl, acetyl, benzyloxymethyl, 2-(trimethylsilyl)ethoxymethyl or allyl.
20. The process of claim 1, wherein R^{14} and R^{15} are, independently, *tert*-butyldimethylsilyl or methoxymethyl.
21. The process of claim 1, wherein R^{25} is *para*-methoxybenzyl.
22. The process of claim 1, wherein J is



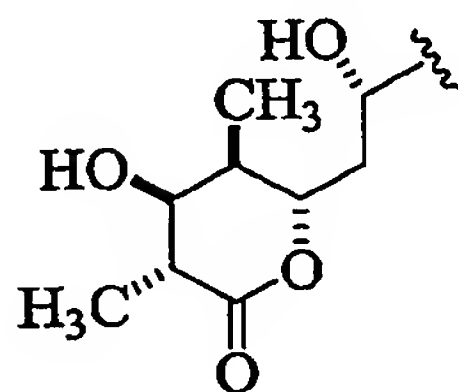
23. The process of claim 1, wherein J is



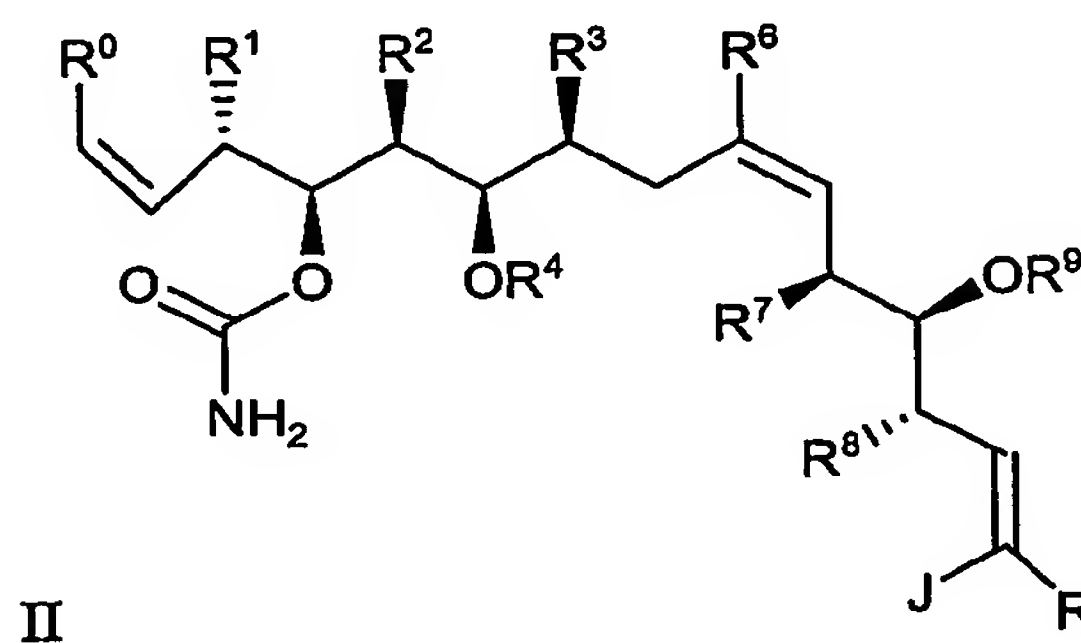
24. The process of claim 1, wherein J is



25. The process of claim 1, wherein J is

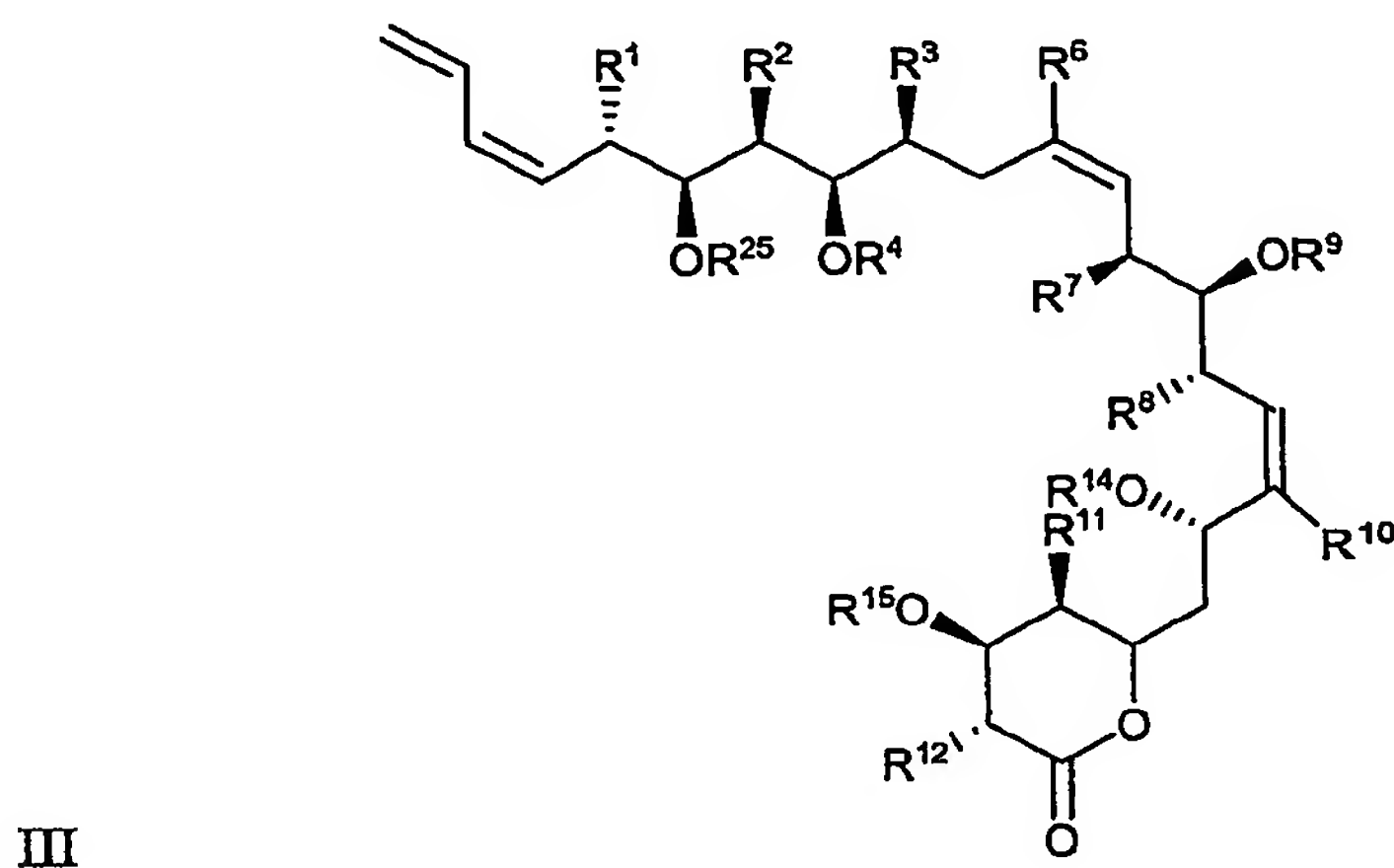


26. The process of claim 1, further comprising a step of synthesizing a compound of formula II

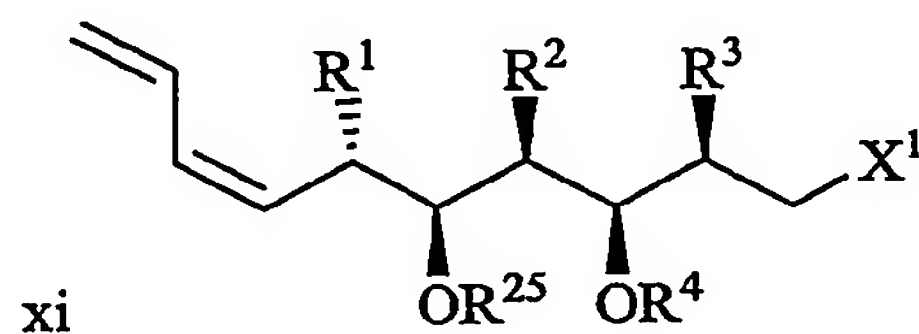


R^{10} from compound I, which comprises contacting the compound of formula I with an oxidizing agent to form a deprotected compound, and contacting the deprotected compound with $Cl_3CCONCO$ in the presence of a hydrolyzing agent.

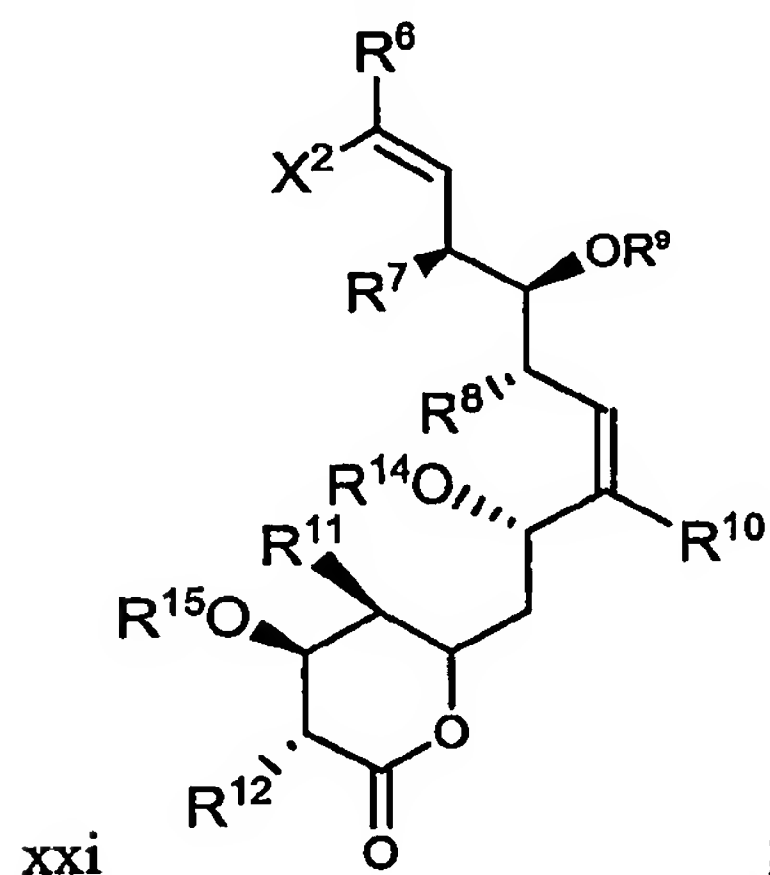
27. The process of claim 26, wherein the oxidizing agent is 2,3-dichloro-5,6-dicyano-1,4-benzoquinone.
28. The process of claim 26, wherein the hydrolyzing agent is Al_2O_3 .
29. A process for synthesizing a compound of formula III



comprising contacting a diene of formula xi



with a lactone of formula xxi



wherein R^1 , R^2 , R^3 , R^6 , R^7 , R^8 , R^{11} , and R^{12} are, independently, H or C_1 - C_{10} alkyl;

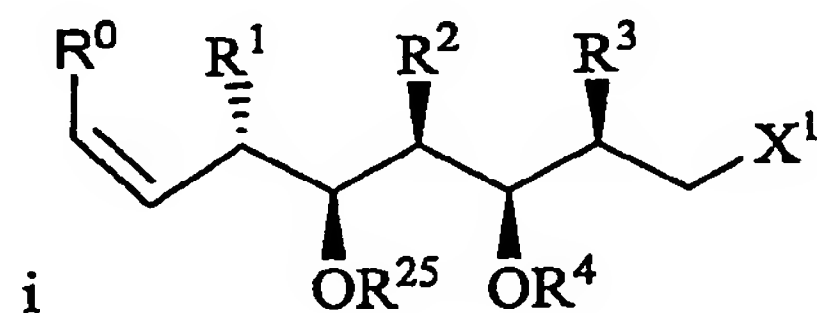
R^4 , R^9 , R^{14} , and R^{15} are, independently, an acid labile hydroxyl protecting group;

R^{10} is hydrogen or C_1 - C_6 alkyl;

R^{25} is hydrogen or an oxidation stable hydroxyl protecting group; and

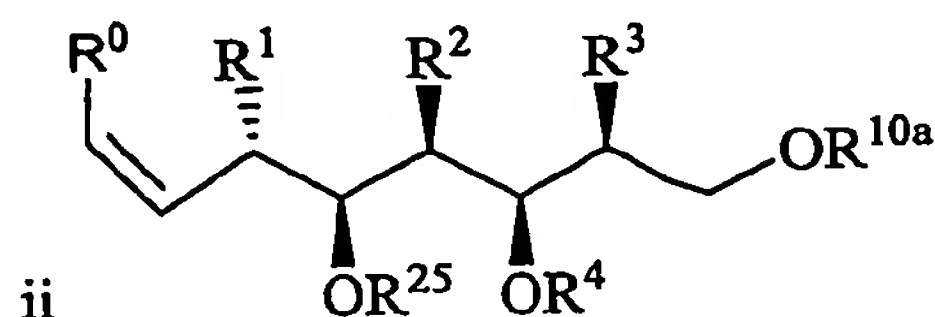
X^1 and X^2 are, independently, a halogen, triflate, tosylate, or mesylate.

30. The process of claim 29, further comprising
subjecting the process to the presence of a catalytically effective amount of a cross-coupling metal catalyst.
31. The process of claim 29, wherein the cross-coupling metal catalyst comprises nickel or palladium.
32. The process of claim 29, wherein the cross-coupling metal catalyst is Pd(0).
33. The process of claim 29, further comprising contacting the compound of formula xi with a metallating agent, wherein the metallating agent is a compound containing boron, zinc, tin or magnesium or aluminum.
34. The process of claim 33, wherein the metallating agent is a compound containing boron.
35. The process of claim 33, wherein the metallating agent is MeO-9-BBN.
36. The process of claim 36, wherein the metallating agent is a compound containing zinc.
37. The process of claim 33, wherein the metallating agent is $ZnCl_2$.
38. The process of claim 29, wherein at least one of X^1 and X^2 are iodine.
39. The process of claim 29, wherein R^1 , R^2 , R^3 , R^6 , R^7 , R^8 , R^{11} , and R^{12} are methyl.
40. The process of claim 29, wherein R^4 , R^9 , R^{14} , and R^{15} are, independently, *tert*-butyldimethylsilyl or methoxymethyl.
41. The process of claim 29, wherein R^{10} is hydrogen.
42. The process of claim 29, wherein R^{25} is *para*-methoxy benzyl.
43. A process for synthesizing a halogenated alkylene of formula i



comprising:

contacting an alkenyl of formula ii



with a mild acid; and

adding to the process $(X^1)_2$ in the presence of $P(R^{18})_3$; wherein:

R^0 is C_{1-6} alkyl, C_{2-6} alkenyl, C_{2-6} alkynyl, $(CH_2)_r(C_{3-6}$ cycloalkyl), $(CH_2)_r$ (aryl) or $(CH_2)_r$ (heterocycle), wherein r is 0, 1, 2, 3, or 4;

R^1 , R^2 , and R^3 are, independently, H or C_1 - C_{10} alkyl;

R^4 is H or an acid labile hydroxyl protecting group;

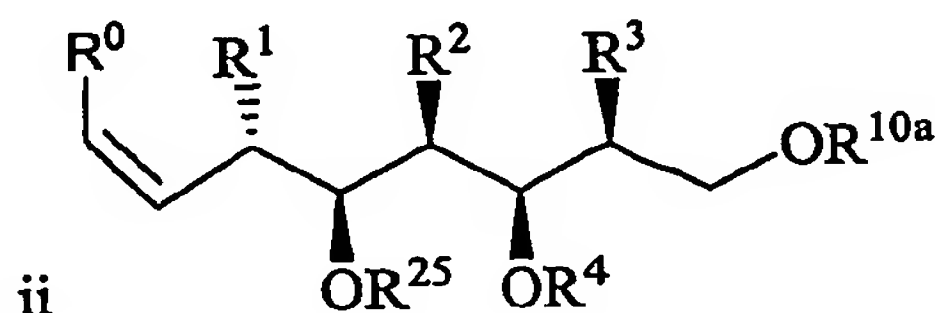
R^{10a} is a hydroxyl protecting group;

R^{18} is C_6 - C_{14} aryl;

R^{25} is hydrogen or an oxidatively labile hydroxyl protecting group; and

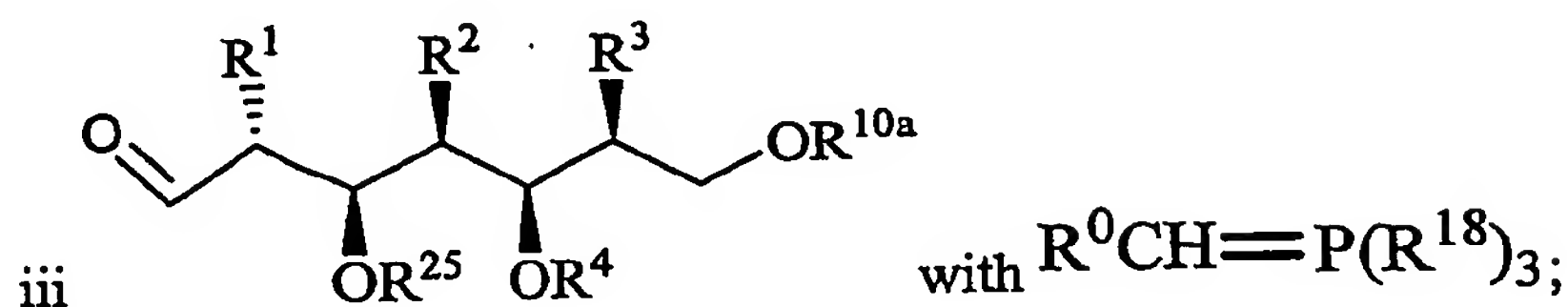
X^1 is a halogen, triflate, tosylate, or mesylate.

44. The process of claim 43 wherein R^0 is ethylene.
45. The process of claim 43 wherein R^1 , R^2 and R^3 are each methyl.
46. The process of claim 43 wherein R^4 is *para*-methoxybenzyl.
47. The process of claim 43 wherein R^{18} is phenyl.
48. The process of claim 43 wherein R^{25} is *tert*-butyldimethylsilyl.
49. The process of claim 43 wherein X^1 is iodo.
50. The process of claim 43, wherein R^{10a} is trityl.
51. A process of synthesizing a compound of formula ii



comprising:

contacting an aldehyde of formula iii



wherein

R^0 is C_{1-6} alkyl, C_{2-6} alkenyl, C_{2-6} alkynyl, $(CH_2)_r(C_{3-6}$ cycloalkyl), $(CH_2)_r$ (aryl) or $(CH_2)_r$ (heterocycle), wherein r is 0, 1, 2, 3, or 4;

R^1 , R^2 , and R^3 are, independently, H or C_1 - C_{10} alkyl;

R^4 is H or an acid labile hydroxyl protecting group;

R^{10a} is a hydroxyl protecting group;

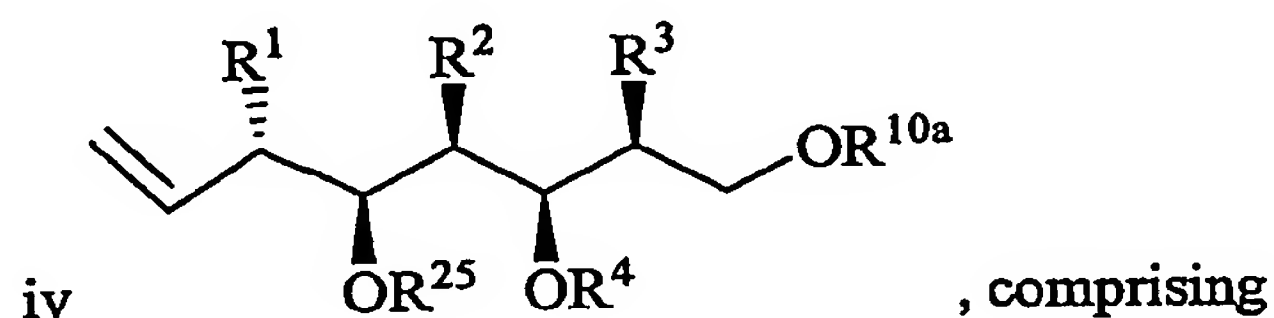
R^{18} is C_6 - C_{14} aryl; and

R^{25} is hydrogen or an oxidatively labile hydroxyl protecting group.

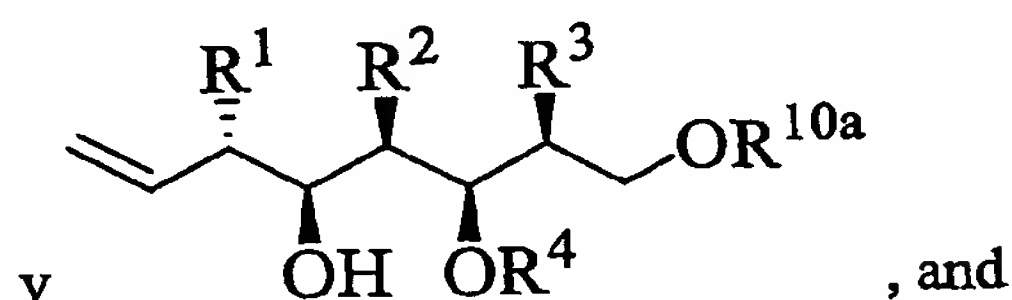
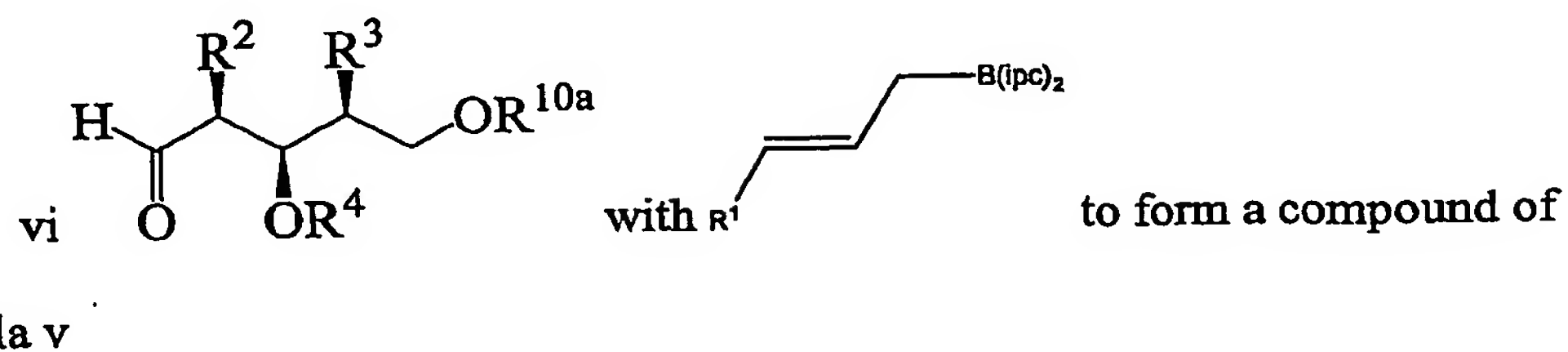
52. The process of claim 51 wherein R^0 is ethylene.
53. The process of claim 51 wherein R^1 , R^2 and R^3 are each methyl.
54. The process of claim 51 wherein R^4 is *para*-methoxybenzyl.
55. The process of claim 51 wherein R^{18} is phenyl.
56. The process of claim 51 wherein R^{25} is *tert*-butyldimethylsilyl.
57. The process of claim 51, wherein R^{10a} is trityl.
58. The process of claim 52, wherein the compound of formula iii is contacted with

allyldiphenylphosphine instead of $R^0CH=P(R^{18})_3$.

59. A process of synthesizing a compound of formula iv



contacting a compound of formula vi



reacting a compound of formula v with ; wherein

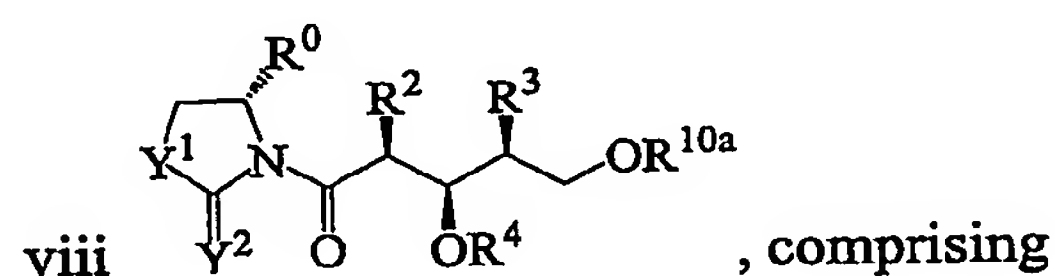
R^1 , R^2 , and R^3 are, independently, H or C_1 - C_{10} alkyl;

R^4 is H or an acid labile hydroxyl protecting group;

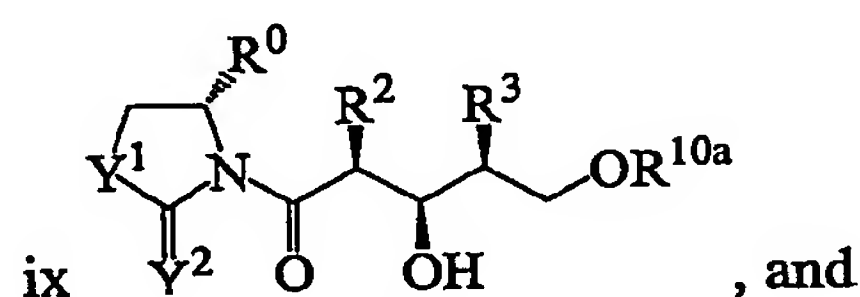
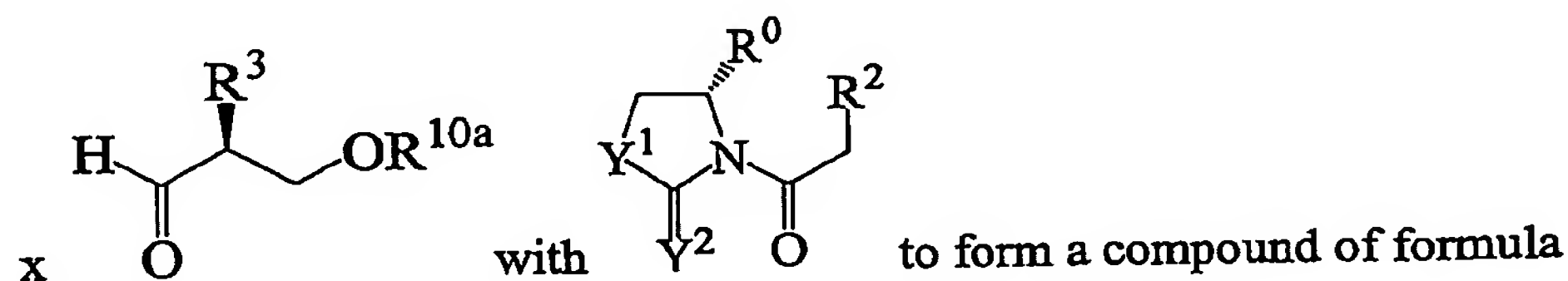
R^{10a} is a hydroxyl protecting group; and

R^{25} is hydrogen or an oxidatively labile hydroxyl protecting group.

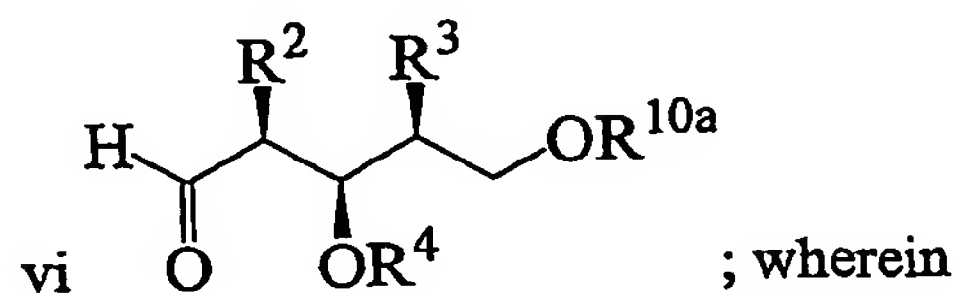
60. The process of claim 59 wherein R^1 , R^2 and R^3 are each methyl.
61. The process of claim 59 wherein R^4 is *para*-methoxybenzyl.
62. The process of claim 59 wherein R^{25} is *tert*-butyldimethylsilyl.
63. The process of claim 59, wherein R^{10a} is trityl.
64. A process of forming a compound of formula viii



contacting a compound of formula x



converting the compound of formula ix to a compound of formula vi



; wherein

R^0 is C_{1-6} alkyl, C_{2-6} alkenyl, C_{2-6} alkynyl, $(CH_2)_r(C_{3-6}$ cycloalkyl),

$(CH_2)_r(aryl)$ or $(CH_2)_r(heterocycle)$, wherein r is 0, 1, 2, 3, or 4;

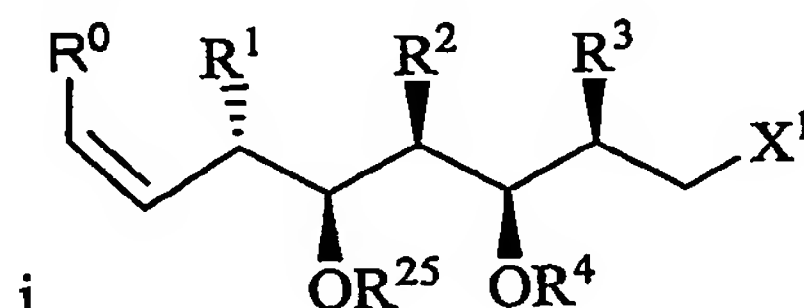
R^2 and R^3 are, independently, H or C_1 - C_{10} alkyl;

R^4 is H or an acid labile hydroxyl protecting group;

R^{10a} is a hydroxyl protecting group; and

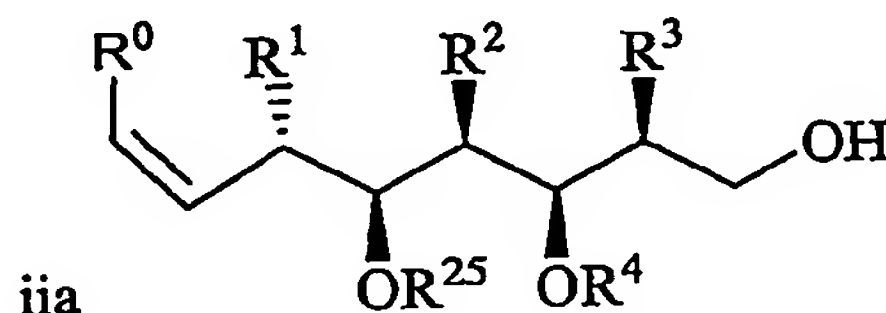
Y^1 and Y^2 are, independently, O or S.

65. The process of claim 64 wherein R^0 is benzyl.
66. The process of claim 64 wherein R^2 and R^3 are each methyl.
67. The process of claim 64 wherein R^4 is *para*-methoxybenzyl.
68. The process of claim 64 wherein R^{10a} is trityl.
69. A process for synthesizing a halogenated alkylene of formula i



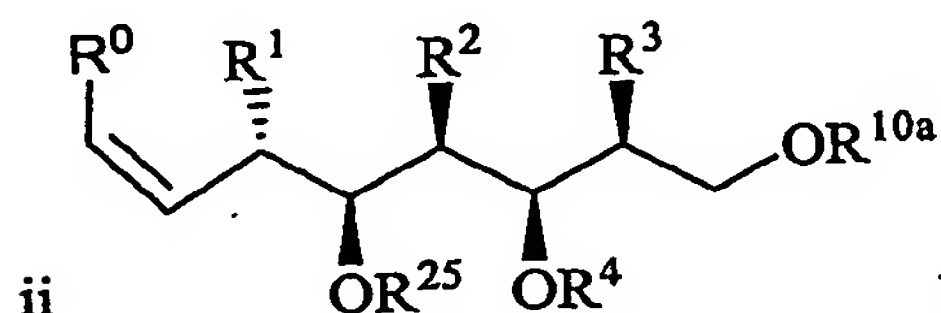
comprising,

contacting an alcohol of formula iia



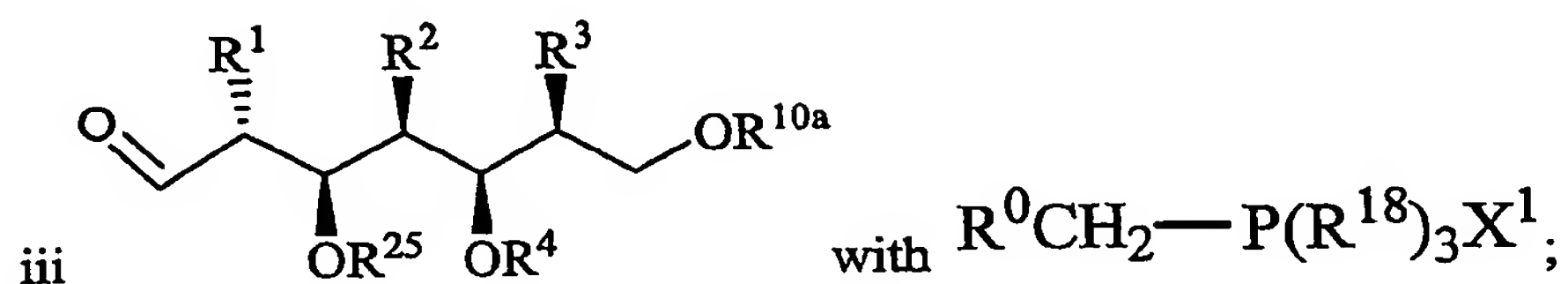
with $(X^1)_2$ in the presence of $P(R^{18})_3$;

yielding the compound of formula iia by contacting an alkylene of formula ii

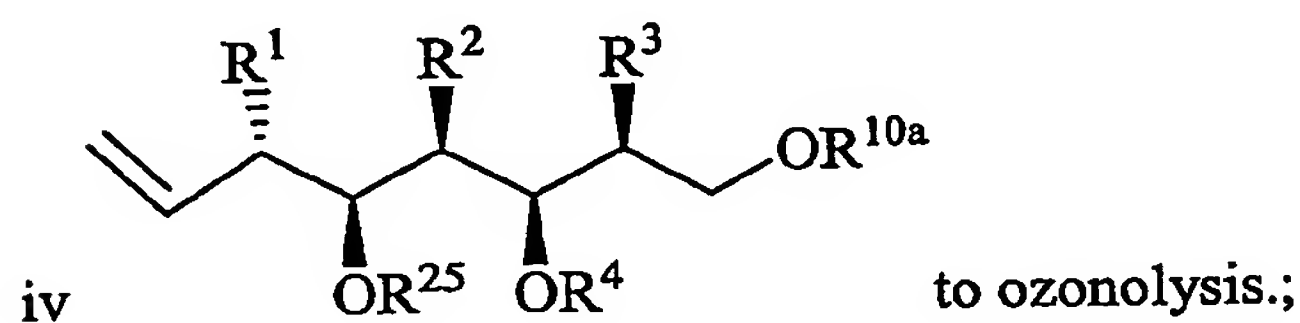


with a mild acid;

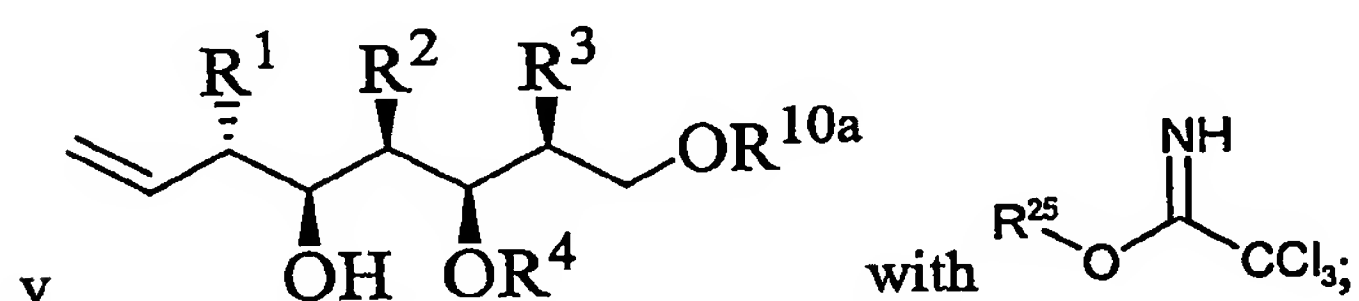
forming the compound of formula ii by contacting an aldehyde of formula iii



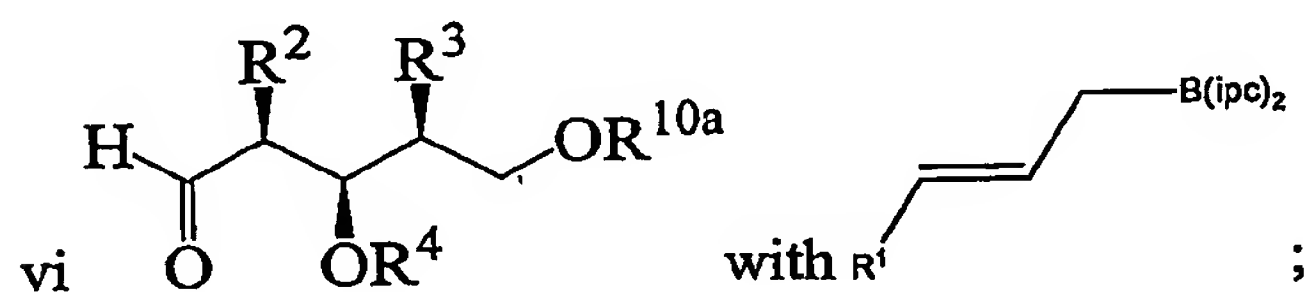
producing the compound of formula iii by subjecting a compound of formula iv



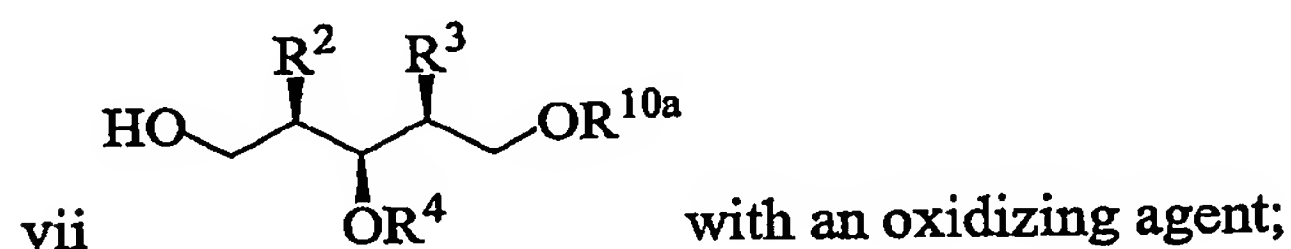
resulting in the compound of formula iv by contacting a compound of formula v



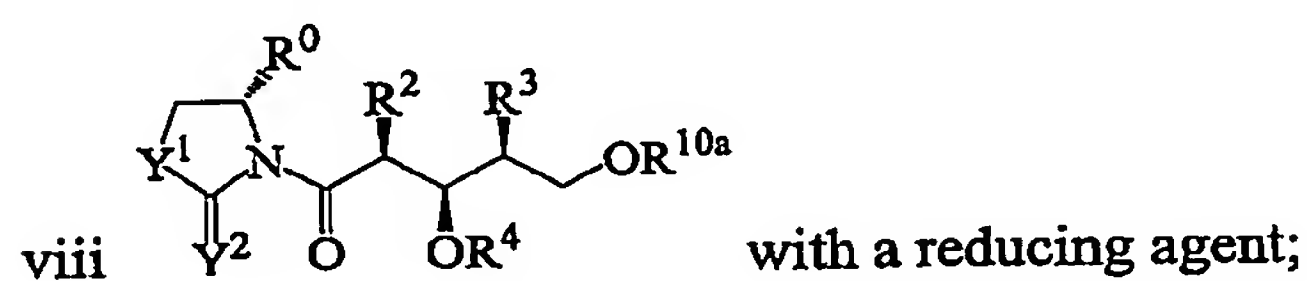
synthesizing the compound of formula v by contacting a compound of formula vi



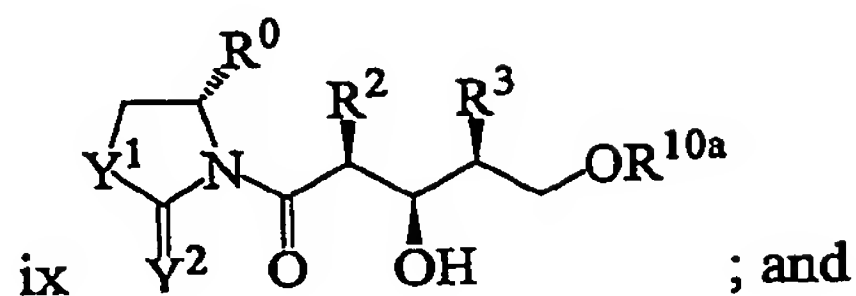
producing the compound of formula vi by contacting a compound of formula vii



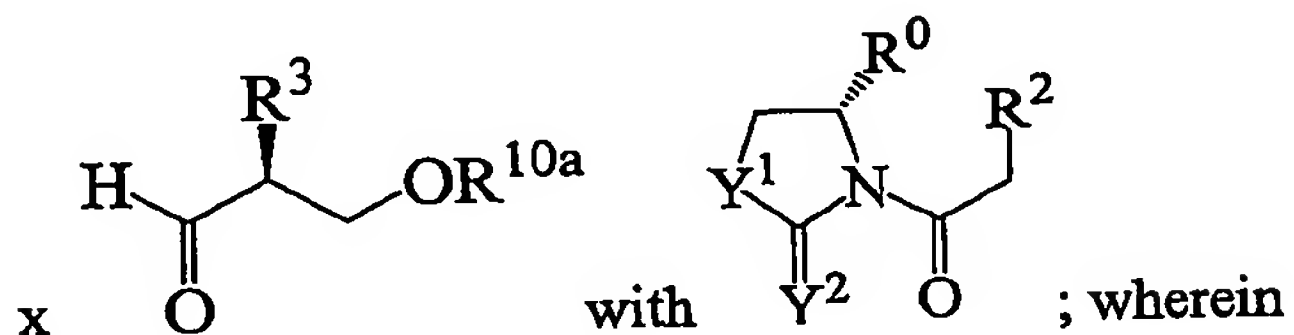
forming the compound of formula vii by contacting a compound of formula viii



synthesizing the compounds of formula viii and by protecting a hydroxyl moiety of a compound of formula ix



yielding the compounds of formula ix and ix' by contacting a compound of formula x



R^0 is C_{1-6} alkyl, C_{2-6} alkenyl, C_{2-6} alkynyl, $(CH_2)_r(C_{3-6}$ cycloalkyl), $(CH_2)_r$ (aryl) or $(CH_2)_r$ (heterocycle), wherein r is 0, 1, 2, 3, or 4;

R^1 , R^2 , and R^3 are, independently, H or C_1-C_{10} alkyl;

R^4 is H or an acid labile hydroxyl protecting group;

R^{10a} is a hydroxyl protecting group;

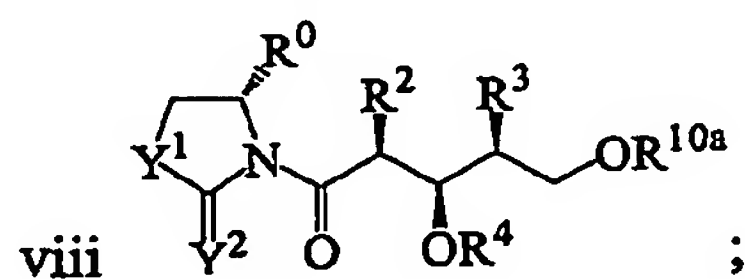
R^{18} is C_6-C_{14} aryl;

R^{25} is hydrogen or an oxidatively labile hydroxyl protecting group;

X^1 is a halogen, triflate, tosylate, or mesylate; and

Y^1 and Y^2 are, independently, S or O.

70. The process of claim 69 wherein R^0 is benzyl.
71. The process of claim 69 wherein R^1 , R^2 and R^3 are each methyl.
72. The process of claim 69 wherein R^4 is *para*-methoxybenzyl.
73. The process of claim 69 wherein R^{18} is phenyl.
74. The process of claim 69 wherein R^{25} is *tert*-butyldimethylsilyl.
75. The process of claim 69 wherein X^1 is iodo.
76. The process of claim 69, wherein R^{10a} is trityl.
77. A compound of formula viii



wherein

R^0 is C_{1-6} alkyl, C_{2-6} alkenyl, C_{2-6} alkynyl, $(CH_2)_r(C_{3-6}$ cycloalkyl), $(CH_2)_r$ (aryl) or $(CH_2)_r$ (heterocycle), wherein r is 0, 1, 2, 3, or 4;

R^2 and R^3 are, independently, H or C_1 - C_{10} alkyl;

R^4 is H or an acid labile hydroxyl protecting group;

R^{10a} is a hydroxyl protecting group; and

Y^1 and Y^2 are, independently, S or O.

78. The compound of claim 77 wherein R^0 is benzyl.
79. The compound of claim 77 wherein R^2 and R^3 are each methyl.
80. The compound of claim 77 wherein R^4 is *para*-methoxybenzyl.
81. The compound of claim 77 wherein R^{10a} is trityl.
82. The compound of claim 77 wherein at least one of Y^1 and Y^2 is S.
83. The compound of claim 77 wherein at least one of Y^1 and Y^2 is O.